INTERNATIONAL SPACE STATION

FISCAL YEAR 2000 ESTIMATES

BUDGET SUMMARY

OFFICE OF SPACE FLIGHT — **U.S./RUSSIAN COOPERATION AND PROGRAM ASSURANCE**

SUMMARY OF RESOURCES REQUIREMENTS

	FY 1998	FY 1999	FY 2000	Page Number
		(Thousands of Dollars)		
Russian Program Assurance	110,000	(248,300)	(200,000)	ISS 2-1
Total	110,000	(248,300)	(200,000)	
Distribution of Program Amount by Installation				
Johnson Space Center	101,600	--	--	
Marshall Space Flight Center	7,600	--	--	
Ames Research Center	700	--	--	
Goddard Space Flight Center	100	--	--	
Total	110,000	--	--	

PROGRAM GOALS

In FY 1997, the budget line item entitiled, U.S./Russian Cooperation and Program Assurance, was established. This budget line item had two parts, U.S./Russian Cooperation (Russian Space Agency contract support) and Russian Program Assurance (RPA). Funding for the first part has been completed. Ythe second part, Russina Program Assurance (RPA), was re-established within the Space Station budget line. The RPA budget was established to fund contigencies and backup capabiliites in response to concerns about the ability of the Russians to meet their ISS commitments. Tese concerns have been heightened by the slippage of the Russian service module (SM) from May 1998 to December 1998 and then to July 1999.

The United States (U.S.) and the Russian Federation have underway a three-phase joint cooperative space program to accomplish five major goals. First, the program permits us to develop, maintain, and enhance capabilities and operations to allow humans to live and work continuously in space. Second, by establishing a relationship with Russia as an international partner for the human exploration and exploration of space, the United States can reduce the cost of future U.S. space initiatives by applying Russian-developed technology. Third, by flying Space Shuttle missions to the Russian Mir, the United States can enhance its understanding of long-duration operations, and gain life sciences and microgravity research benefits from long-duration experimentation. Fourth, and of considerable importance, early cooperation with the Russians permits us to develop common systems and operating procedures which will increase the probability of success and mitigate risks in the design, assembly, and operation of the International Space Station (ISS) in which they are a full partner. Finally, this relationship between the U.S. and Russian space agencies advances U.S. national space programs as well as U.S. aerospace industry.

STRATEGY FOR ACHIEVING GOALS

The Russian Space Agency (RSA) contract provided services and hardware for Phase I and selected Phase II activities related to the ISS program. Phase I of the program expands the joint participation by U.S. and Russian crews in Mir and Space Shuttle operations. This expanded program used the unique capabilities of the Space Shuttle and the Russian Space Station Mir and provided support for nine flights to Mir, including seven long-duration stays of U.S. crew. Phase I provided valuable experience and test data which greatly reduced technical risks associated with the construction and operation of the ISS and provided early opportunities for extended scientific and research activities. The Russian Space Station’s capabilities have been enhanced by contributions from both countries. The Space Shuttle delivered new Russian-built solar arrays to replace existing arrays on Mir, and one of these new arrays used solar cells provided by the U.S. Russia has launched the Spektr and Priroda modules to its station, equipped with U.S., Russian, and other international scientific hardware to support science and research experiments. In 1996, NASA exercised options to add an eighth and ninth shuttle flight to Mir. These additional flights will assist Russia in meeting its commitment to deliver key elements used in the early assembly of the ISS and permitted additional NASA astronauts to perform long-duration missions on Mir. The eighth and ninth Mir flights used the Space Shuttle to reduce a significant logistics shortfall on Mir, conduct vital engineering research and expand our knowledge and experience of the effects of long-duration weightlessness. This approach took into account the joint U.S./Russian interest in continuation of the Shuttle/Mir program, while minimizing changes to the ISS development plan.

During Phase I, the RSA provided management, Mir lifetime extension, Mir capabilities expansion, docking hardware and mission support for both long-duration and short-term, joint missions. Management activities included project documentation, and program and subcontract management. Mir lifetime extension included system requirements planning, communication and control systems analyses and upgrades, thermal control documentation and requirements definition, environmentally closed life support system (ECLSS) upgrades, power supply system upgrades, and propulsion systems documentation. To expand Mir capabilities, Russia and the U.S attached Spektr and Priroda modules to the Mir for scientific use.

Phase II combines U.S. and Russian hardware to create an advanced orbital research facility with early human-tended capability. This facility will significantly expand the scientific and research activities initiated in Phase I, and will form the early core of the ISS. Selected Phase II activities in the contract develop systems capabilities, support, and other infrastructure for the ISS. Under a fixed-price contractual arrangement with NASA, the RSA furnished supplies and/or services to enhance Mir operational capabilities, perform joint space flights, and conduct joint activities that will assist in the design, development, operations, and utilization of the ISS. During this phase, the RSA also provides management, advanced technology, associated analyses, and ISS elements. ISS elements include: requirements definition of a joint airlock and delivery of androgynous peripheral docking system (APDS) hardware; service module modifications; FGB energy block modifications; delivery of repress/depress pumps for the airlock; and study and documentation related to a scientific power platform.

The U.S./Russian Cooperation and Program Assurance (RPA), as part one Step one, was initiated in May 1997. It provided contingency planning funds to address ISS program requirements resulting from delays on the part of Russia in meeting its commitments to the ISS program. The first step in the contingency plan, which was to protect against a potential further delay in the SM, has been implemented. The ISS program is purchasing an interim control module (ICM) from the U.S. Naval Research Laboratory (NRL) to provide attitude control and reboost functions for continuation of the ISS assembly sequence in case the Russian SM is launched later than July 1999. The NRL's ICM is currently being prepared to support a March 2000 launch to back up any shortfall of Progress fuel resupply vehicles. The Program is also maintaining an option to attach it to the back of the Russian-built functional cargo block (FGB), should the Russian Service Module slip considerably beyond its scheduled launch in July 1999.

Step One of NASA's RPA contingency plan had two primary components. First, modifications were done to the Zarya, an element purchased from Russia and owned by the U.S, to enhance the Zarya's propulsion control capabilities and make it refuelable. The Zarya was launched on November 20, 1998. Second, the development of an interim control module (ICM) is being pursued to ensure that sufficient attitude and reboost capability is available if required in the assembly sequence. The Zarya modifications and the ICM addition will enable the on-orbit build to continue even without the Russian Service Module, although not as planned due to the loss of the Service Module's habitation resources. This would result in increased risk due to the absence of an ISS-based crew to address real-time problems, which can be expected to arise. It would also result in lost research opportunities, resulting in a significant research gap or the introduction of new Shuttle based research opportunities. Other RPA activities included purchase of docking adapters and SM flight support equipment from RSA, airlock modifications, O^2 compressor for the airlock, and other related ICM tasks. In 1999, RPA funding for Step one will support the completion of assembly, test and checkout of the ICM.

The second step of the RPA program is addressed under the International Space Station narrative.

MEASURES OF PERFORMANCE

Delivery of docking mechanisms Plan: 1st, 2nd, 3rd Qtrs. FY 1998 Actual: August 1998	Delivery of androgynous peripheral attachment system (APAS, a docking mechanism) from Energia associated avionics and control panels for ISS/Shuttle.
ICM CDR Plan: December 1997 Actual: December 1997	NRL and ISS program office completed the critical design review (CDR) for the ICM

SM Launch	The SM will be launched as part of the ISS Revision C Assembly Sequence
Plan: December 1998	
Revised: July 1999	Revised launch date per ISS Revision D Modified Assembly Sequence
FDRD Completed	Flight design requirements document (FDRD) baseline established in order to allow Shuttle to begin flight design processes
Plan: February 1998	
Revised: February 1999	Revised per ISS Revision D Modified Assembly Sequence
Phase II GSR	Phase II ground safety review (GSR) at KSC
Plan: March 1998	
Actual: March 1998	
Phase II FSR	Phase II flight safety review (FSR) at JSC
Plan: April 1998	
Revised: January 1999	Revised per ISS Revision D Modified Assembly Sequence
Cargo Integration Review (CIR)	Review of cargo element with Shuttle Program
Plan: April 1998	
Actual: June 1999	Revised per ISS Revision D Modified Assembly Sequence

ACCOMPLISHMENTS AND PLANS

In FY 1998, RPA major activities included continuation of FGB performance modifications, airlock modifications, and docking adapters. Activities accomplished in building the ICM included:

- Completion of desgin and requirement modifications;
- Inspection and refurbishment of the primary structure;
- Completion of the build and testing of the 110lb Thurster Engine; and
- Receipt of both the active and passive Russian androgynous peripheral assembly system (APAS) adapters

In FY 1999, this budget will be discontinued. A new budget line titled “Russian Program Assurance” will be established within the International Space Station program.